

Abstract Submitted
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Charge $4e$ superconductivity from pair density wave order in high temperature superconductors¹ EDUARDO FRADKIN, Dept of Physics, University of Illinois, EREZ BERG, Dept. of Physics, Harvard University, STEVEN KIVELSON, Dept. of Physics, Stanford University — Several spectacular experimental anomalies have recently been discovered in certain cuprates, notably LBCO and LNSCO, which exhibit unidirectional spin and charge order (known as “stripe order”). These observations are evidence for a novel “striped superconducting” state, in which the superconducting order parameter is modulated in space, such that its average is precisely zero. We show[1] that thermal melting of the striped superconducting state can lead to a number of unusual phases, of which the most novel is a charge $4e$ superconducting state, with a corresponding fractional flux quantum $hc/4e$. These are never-before observed states of matter, that cannot arise from the conventional BCS mechanism. Direct confirmation of their existence, even in a subset of the cuprates, could have much broader implications for our understanding of high temperature superconductivity. We propose experiments to observe fractional flux quantization, which thereby could confirm the existence of these states. [1] E. Berg, E. Fradkin and S. A. Kivelson, Nature Physics 5, 830 (2009).

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